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Indian Standard

AUTOMOTIVE TYRES — PRECURED PATCHES FOR REPAIRING — CROSS PLY/RADIAL TYRES AND INNER TUBES — SPECIFICATION

ICS 83.160.10

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 2004

Price Group 3

Automotive Tyres, Tubes and Rims Sectional Committee, TED 7

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Tyres, Tubes and Rims Sectional Committee had been approved by the Transport Engineering Division Council.

In this standard SI units have been used, the unit of force in Newton (N), of tyre load in kilogram (kg) and of pressure in pascal (Pa). Their relationships are given below for information:

1 kgf = 9.806 65 N (exactly)
= 9.81 N (approximately)
= 10 N (within 2% error)
1 kPa = 0.01 kgf/cm^2 (within 2% error)
1 kgf/cm^2 = 98.066 kPa.

NOTE — Values of kPa rounded to the nearest practical unit.

The composition of the Committee responsible for formulation of this standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE TYRES — PRECURED PATCHES FOR REPAIRING — CROSS PLY/RADIAL TYRES AND INNER TUBES — SPECIFICATION

1 SCOPE

This standard prescribes the requirement for precured patches intended for repairing pneumatic tyres and tubes inner for tyres.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
3400	Methods of test for vulcanized rubber:
(Part 1) : 1987	Tensile stress strain properties (*second revision*)
(Part 2) : 1995	Hardness (*second revision*)
(Part 9) : 1987	Density (*second revision*)
(Part 17) : 1974	Tear strength — Angular test piece
4910 (Part 2) : 1989	Tyre yarns, cords and tyre cord warpsheets made from man-made fibres-Method of test: Part 2 liner density (*first revision*)

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply.

3.1 Precured Tyre Patch (Dual Cure Patch) — This is a cured rubber assembly reinforced with rubber coated fabric plies as per specification. For vulcanization with tyre, cured assembly is provided with a specially formulated face gum or chemical unvulcanized integral layer, which is protected by polythelene or metalized film.

3.1.1 *Cold Bonding* — Vulcanization at room temperature is initiated by treating these unvulcanized bottom layer of the patch with specially prepared chemical vulcanizing solution. The prepared inner surface of tyre must also be treated with chemical vulcanizing cement for effective cold bonding.

3.1.2 *Hot or Precure Process* — When using these patches while retreading, the inside of the tyre can be treated with black vulcanizing cement whereas the patch has to be given a coat of chemical vulcanizing cement.

NOTE — Patch with face gum bottom layer can be treated with black vulcanizing cement when used with heat in conventional or precure retreading.

3.2 Precured Patch for Tube Repairs — A cured patch laminated with a chemical cushion gum protected by a polythelene film, or a cured patch with a chemical unvulcanized layer integral at the bottom protected by a metal foil or metallized film.

3.3 Chemical Patch — Chemical patch consists of a top layer, plies, a bottom layer and a special gum layer. The assembly is then cured and supplied as chemical patch. In this case the vulcanization is activated by using a special self vulcanizing fluid on the patch before application.

3.3.1 Chemical patch shall have the following requirements:

a) No possibility of any air pockets,
b) It is thin and light in weight and hence no spotty wear, and
c) Since vulcanizing process will begin only on application of accelerator its shelf life can be prolonged.

3.4 Chemical Vulcanizing Cement — This is a specially formulated rubber based cement which is used with precure chemical patches to facilitate cold bonding with tyre or tube.

3.5 Face Gum Patch — The face gum patch consists of specified number of coated fabric layers sandwiched between rubber compound layers. The assembly is then cured and topped with a layer of gum compound. Specification for rubber base material used for calendering fabric used for patches is given in Table 1.

Table 1 Rubber Base Material Used for Calendring Fabric Used for Patches

(*Clause* 3.5)

Sl No.	Nature of Test	Requirement	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Appearance	The material shall have smooth finish without wrinkles	—
ii)	Specific gravity	1.100, *Max*	IS 3400 (Part 9) (Method B)
iii)	Hardness—durometer-shore A	35-40 (Base stock)	IS 3400 (Part 2)
iv)	Stress strain properties Test slab shall be cured at 138 ± 1°C for the recommended cure time by the manufacturer:		IS 3400 (Part 1)
	a) 300 percent modulus, kg/cm^2	60, *Min*	
	b) Tensile strength, kg/cm^2	200, *Min*	
	c) Elongation at break, percent	550, *Min*	
v)	Angle tear, kgf/cm	60, *Min*	
vi)	Tests for fabric cord breaking strength	8 kg, *Min*	IS 4910 (Part 2)

3.6 Cleaning Solvent — It is an organic solvent used for dissolving dirt and grime especially rubber dust. It also acts as cleaning solvent for better adhesion of patch to be used after buffing/brushing and before application of vulcanizing cement and the patch.

3.7 Black Vulcanizing Cement — Black vulcanizing cement is applied on the buffed carcass prior to application of precured patch. This acts as a bonding media between the patch and the carcass and/or cushion. A base stock with natural rubber and other required chemicals/ingredients is made and mixed with rubber solvent in a cement mixing churn. The resultant solution should have uniform viscosity and required total solid content (TSC).

4 TESTS

4.1 Appearance

The patch shall be free from wrinkles kinks and air trapings.

4.1.1 *Classification*

The patches are to be suitably classified as per the use on cross ply tyres, radial tyres and tubes and also as per suitability for various injury sizes.

4.1.2 *Dimensions*

Every manufacturer shall recommend the specific size of the patch for specific size of injury corresponding to the size and ply rating of the tyres. For guidance patch dimension are given in Table 2.

4.2 Black Vulcanizing Cement

The cement shall have uniform brushable consistency, free from lumps of undissolved rubber and sedimentation. Five litres sample shall be drawn for testing.

4.3 Type of Material for Tyre Patch

Reinforcement material shall be nylon (Bias) or polyester (Radial) of a suitable denier and EPI warpsheet and square woven (small patches) to give reinforcement to the tyre injury and flex in operation. Cord strength 8 kg minimum when tested as per IS 4910 (Part 2).

Table 2 Patch Dimension (for Guidance Only)

(*Clause* 4.1.2)

Sl No.	Injury Size	Minimum Number of Plies	Minimum Dimensions of Patch (Length and Width) mm	Minimum Dimensions of Plies mm
(1)	(2)	(3)	(4)	(5)
i)	1/4″	2	50 × 50	30 × 30
ii)	1/2″	4	125 × 125	100 × 100
iii)	1″	4	175 × 175	125 × 125
iv)	2″	6	200 × 200	150 × 150
v)	3″	6	250 × 250	200 × 200
vi)	4″	6	300 × 300	250 × 250

NOTE — 10 numbers sample shall be drawn for testing of each type.

4.4 Physical Properties

The physical properties of all material namely, patches and vulcanizing cement shall be as per requirements given in Tables 3 and 4.

Table 3 Physcial Properties for Patches

(*Clause* 4.4)

Sl No.	Nature of Test	Requirements
(1)	(2)	(3)
i)	Appearance	The material shall be free from dirty moulding blisters, air traps and kinks
ii)	Dimensions	As agreed to between the manufacturer and the purchaser
iii)	Peeling strength between patch and substract	5 kgf / 25mm, *Min*
iv)	Tube repair patches shall be tested using inflator device for debonding and gripping of the patches cured at room temperature by black part shall not be more than 3 percent in 8 h duration.	

NOTE — Tests at Sl No. (iii) and (iv) shall be carried out after 24 h of application for chemical patches cured at room temperature and for heat cure patches, after attaining the room temperature.

Table 4 Physical Properties for Black Vulcanizing Cement
(*Clause* 4.4)

Sl No. (1)	Nature of Test (2)	Minimum Requirements (3)	Method of Test, Ref to (4)
i)	Appearance	The fluid shall have uniform consistency free from lumps of undissolved rubber and sedimentation	—
ii)	Specific gravity	1.13, *Max*	IS 3400 (Part 9) Method 'B'
iii)	Scorch time *t*5 (Time for 5 units rise from min viscosity) at 138 ± 1°C, min	10-14, *Min*	
iv)	Optimum cure time *t*95 at 138 ± 1°C, min	5-7	
v)	Hardness IRHD/Shore A	45, *Max*	IS 3400 (Part 2)
vi)	Stress-strain properties:		IS 3400 (Part 1)
	a) 300 percent modulus	50 to 60 kg/cm^2	
	b) Tensile strength	200 kg/cm^2, *Min*	
	c) Elongation at break	600 percent, *Min*	
	d) Angle tear, kgf/mm	7 kgf/mm, *Min*	IS 3400 (Part 17)
vii)	Viscosity at room temperature	1 200 to 2 000 cps	
viii)	Touch dry time, at 25°C to 40°C and 70 percent humidity	a) 10 to 20 min for spray drying b) 30 to 40 min for brush application	
ix)	Total solid content	a) 8 to 10 percent for spray consistency b) 12 to 15 percent for brushing consistency	
x)	Cured pull test adhesion	5 kgf / 25mm, *Min*	Annex A

NOTE — Tests at Sl No. (ii) to (vii) shall be carried out only on the base stock duly cured after removal of solvent.

5 ACCEPTANCE OF MATERIAL

The material offered shall conform to the requirements given in this standard in full. The tests shall be carried out on the parts directly or on the specimen prepared from the component. If the sample fails in any of the tests the material shall be considered as not having met the requirement of this standard.

6 SHELF LIFE

6.1 All material shall render satisfactory performance and shall meet the physical properties requirement as given in Table 3 and Table 4, when tested within 6 months for face gum patch, 12 months for chemical patch, and 6 months for vulcanizing fluid/cement from the date of supply to end user.

6.2 The manufacturer shall supply material within 15 days from the date of manufacture.

6.3 The material shall be transported in a manner protecting it from any physical damage during transit.

6.4 Area of storage shall preferably be cool and dry. The surrounding area temperature shall not exceed ambient temperature. The maximum ambient temperature in the storage shall be 35°C.

7 USAGES OF MATERIAL

Patches and vulcanizing fluid/cement shall be used of the same manufacturer.

8 PACKING AND MARKING

8.1 Material shall be suitably packed in card board boxes or in poly bags to withstand transit and storage handling.

Patches: 10 numbers in each box or as agreed upon.

Vulcanizing cement: Collapsible aluminium or multilayer tubes (for small quantity) or in wide mouth 1 litre capacity tin or as agreed upon.

8.2 The packed containers tins shall be labelled/printed with the following:

a) Name of the manufacturer and/or trade-mark,
b) Quantity,
c) Size of patch and application,
d) Month and year of manufacturing, and
e) Expiry date.

8.3 Each patch shall be marked with the following:

a) *For tube patch*
  1) Manufacturer's trade-mark, and
  2) Size.

b) *For tyre patch*
  1) Manufacturer's trade-mark,
  2) Type of patch and its size, and
  3) Arrow indicating the direction of fitment.

9 BIS CERTIFICATION MARKING

The product may also be marked with the Standard Mark.

9.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clause* 4.4)

PROCEDURE FOR CURING AND PREPARING SPECIMEN FOR ADHESION TEST

A-1 ROOM TEMPERATURE CURE

A-1.1 Take a piece of strong cured rubber sheet of about 15 mm thickness or preferably a Piece of rubberized conveyor belting of equivalent size of the patch.

A-1.2 Gently buff the surface with a 32 grit carbide rasp to produce a fresh rubber surface with a texture similar to the RMA 2 standard.

A-1.3 Clean the buffed surface thoroughly with a solvent and allow the solvent to dry.

A-1.4 Apply the chemical vulcanizing cement on the buffed surface and allow it to dry for 10 to 15 min.

A-1.5 Peel the backing from the patch specimen and apply one even coat of chemical vulcanizing cement and allow it to dry for 10 or 15 min.

A-1.6 Place the release paper covering half of the cemented rubber piece.

A-1.7 Place the cemented patch on top of this and press well without trapping air.

A-1.8 Place a small weight of about 5 kg on the assembly to ensure proper contact.

A-1.9 Allow the assembly to cure undisturbed for about 24 h or as per the manufacturer's recommendation, whichever is less.

A-1.10 After curing, cut the assembly in strips of 25mm width.

A-1.11 Clamp the specimen between the fixed and the moving jaws of a tensile tester and peel the specimen, apart at a speed of 50 mm/ min.

A-1.12 Note the peaks of force required for peeling while the specimen is being pulled. It may be necessary to make small nicks with a sharp knife to facilitate peeling along the bond surface.

A-1.13 Since the strips are of 25 mm width, the values obtained are in kgf. The value of the lowest peak should not be less than 5 kgf/25 mm.

A-2 HEAT CURE

A-2.1 Prepare the specimen as per **A-1.1** to **A-1.8** in the room temperature cure test.

A-2.2 Place the assembly in a specifically designed diaphragm press or in an autoclave with proper protection.

A-2.3 In the press, temperature should be maintained at 100 ± 1°C. The pressure in the diaphragm should be 3 kg/cm and the cure time as per the manufacturer's recommendation.

A-2.4 In the autoclave the specimen should be cured at 100°C and 3 kg/cm pressure hot air for a period specified by the manufacturer (steam should not be used as the temperature of steam is more than 140°C at 3 kg/cm^2 pressure).

A-2.5 After curing test the specimen to adhesion as per **A-1.11** to **A-1.13**. The breaking of adhesion shall be such that, it takes out the surface of the substract instead of breaking the bond.

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Automotive Tyres, Tubes and Rims Sectional Committee, TED 7

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Ashok Leyland Ltd, Chennai	SHRI R. C. BALAKRISHANAN SHRI C. SUNDARSANAN (*Alternate*)
Association of State Road Transport Undertaking, New Delhi	DIRECTOR
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